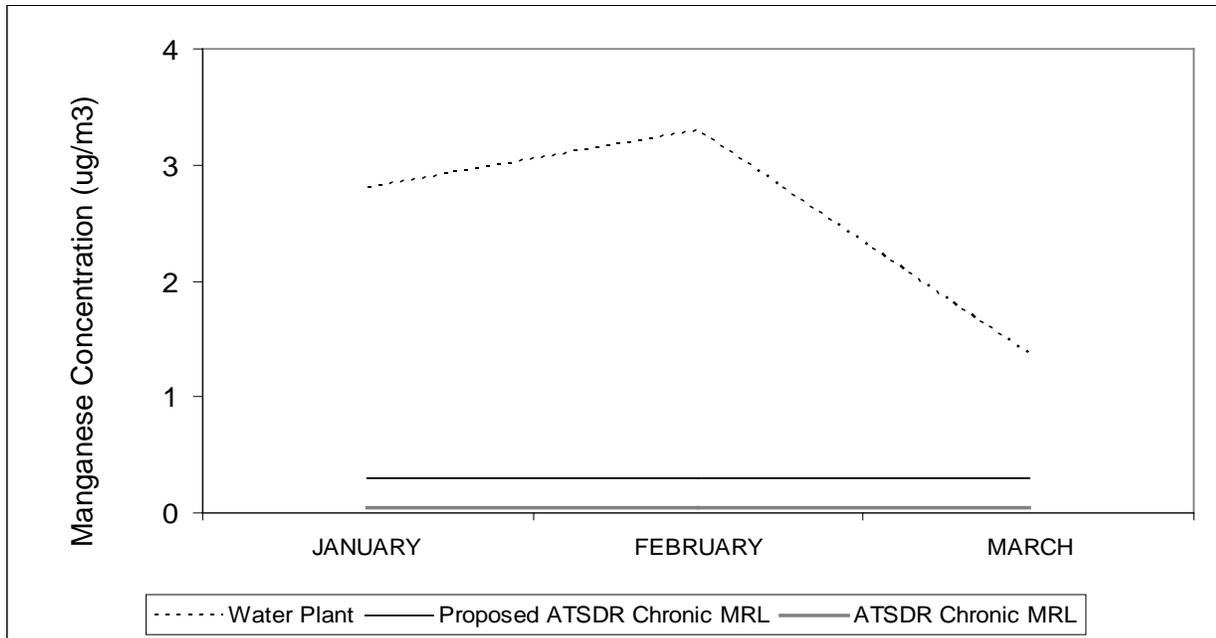


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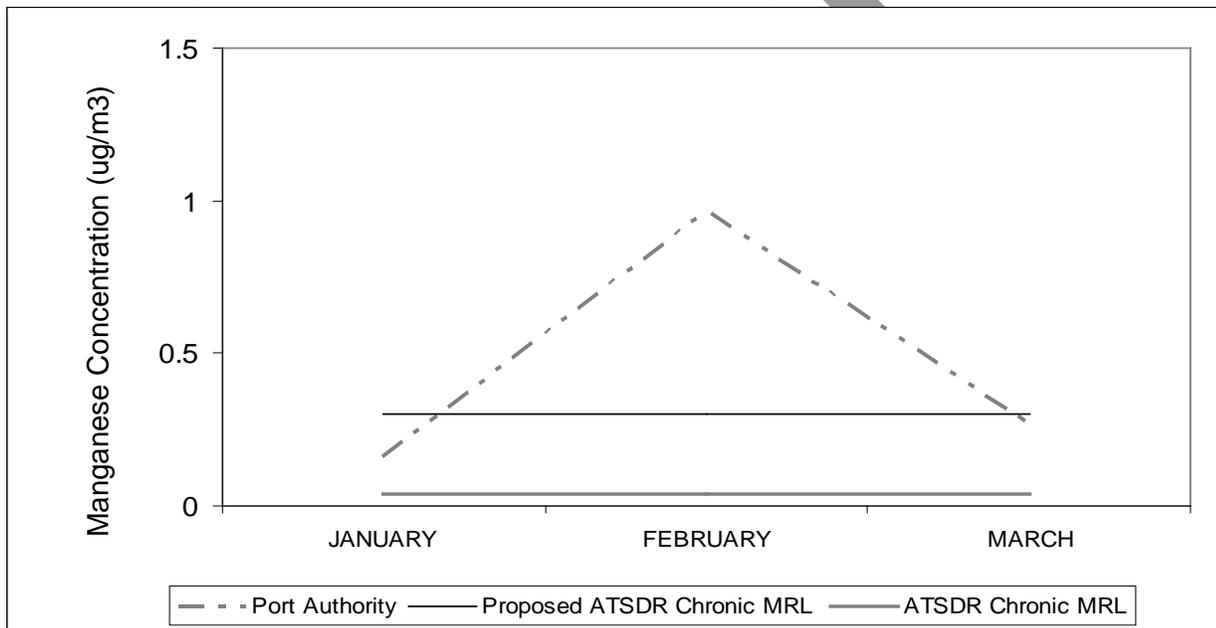
**Appendix B**

**Manganese Concentrations in Columbiana County (1999-2008): Composite Yearly Data**

**Figure 1. Manganese Concentration at the Water Plant (1999)**



**Figure 2. Manganese Concentration at the Port Authority (1999)**



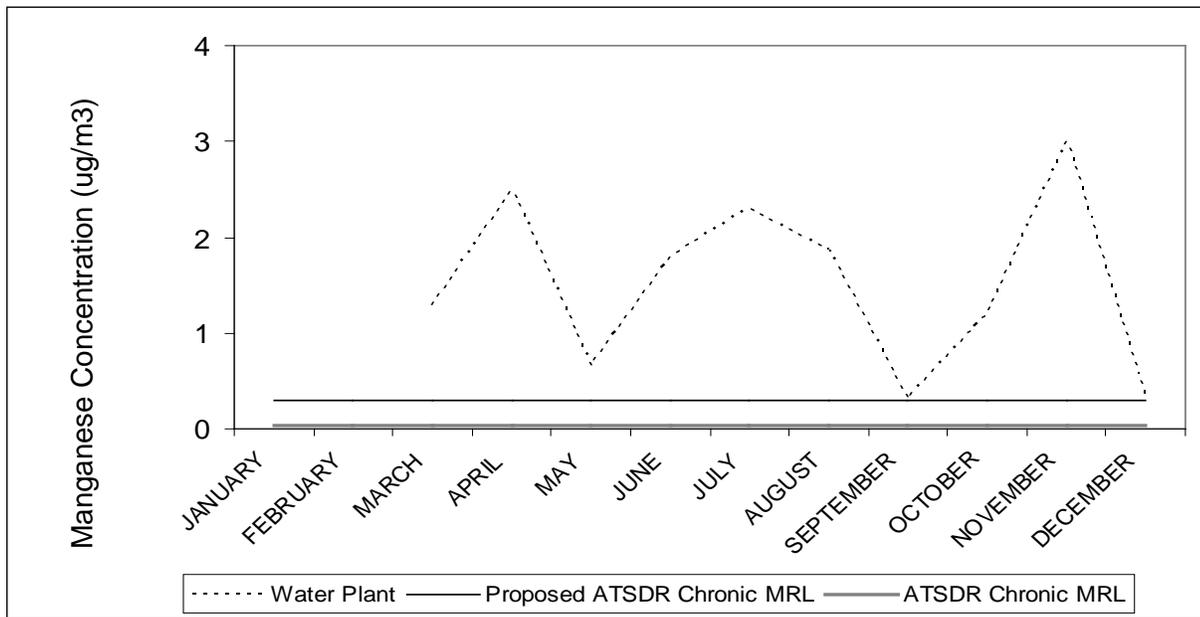
**Table 1. Summary Statistics for Manganese Concentration in Columbiana County (1999)**

	Water Plant	Port Authority
<b>Statistic</b>		
<i>Min</i>	1.36	0.163
<i>Arithmetic average</i>	2.48	0.466
<i>Geometric average</i>	2.32	0.349
<i>25th percentile</i>	2.08	0.216
<i>50th percentile</i>	2.8	0.269
<i>75th percentile</i>	3.05	0.618
<i>90th percentile</i>	3.19	0.827
<i>95th percentile</i>	3.24	0.896
<i>99th percentile</i>	3.28	0.952

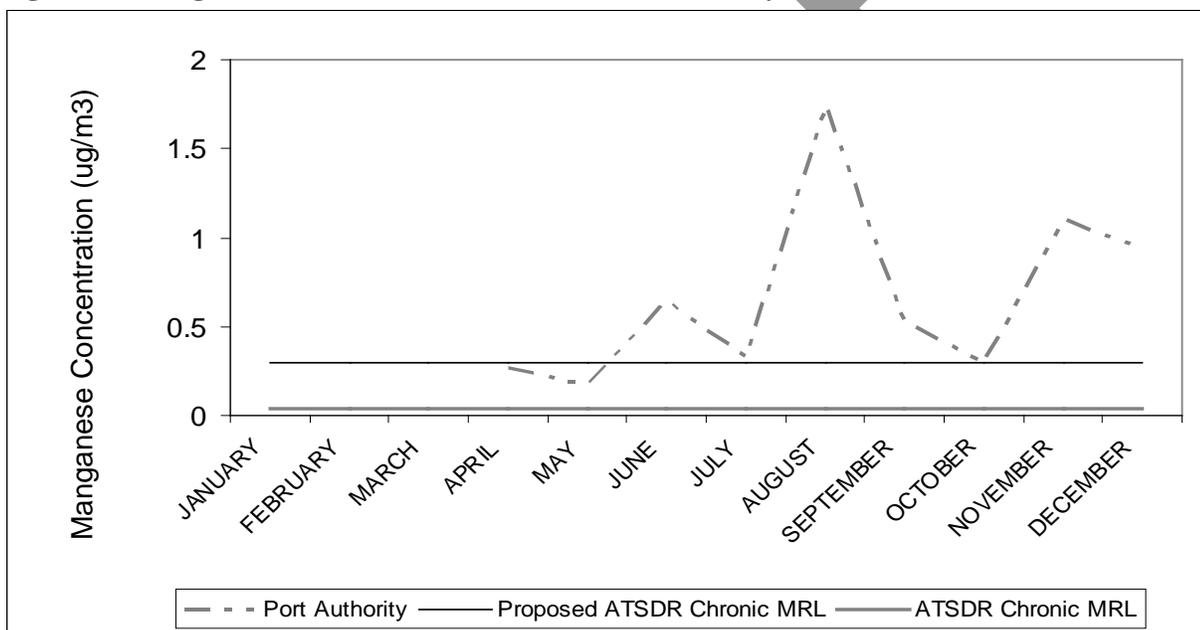
<i>Max</i>	3.29	0.966
<i>Std Deviation</i>	1.00	0.436

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**Figure 3. Manganese Concentration at the Water Plant (2000)**



**Figure 4. Manganese Concentration at the Port Authority (2000)**

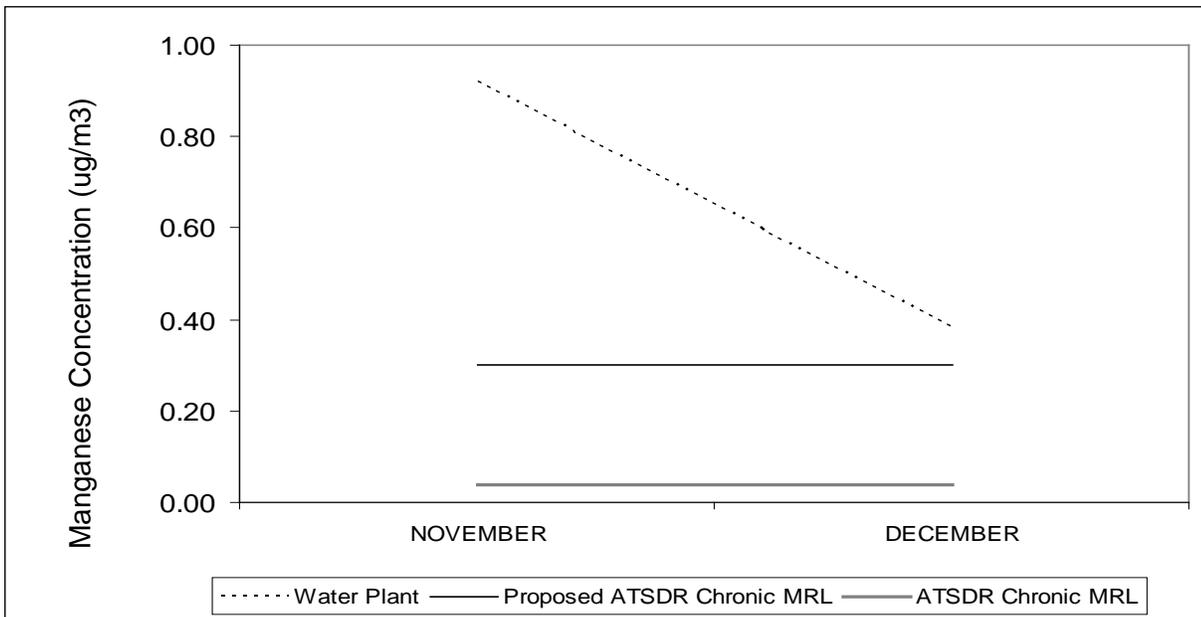


**Table 2. Summary Statistics for Manganese Concentration in Columbiana County (2000)**

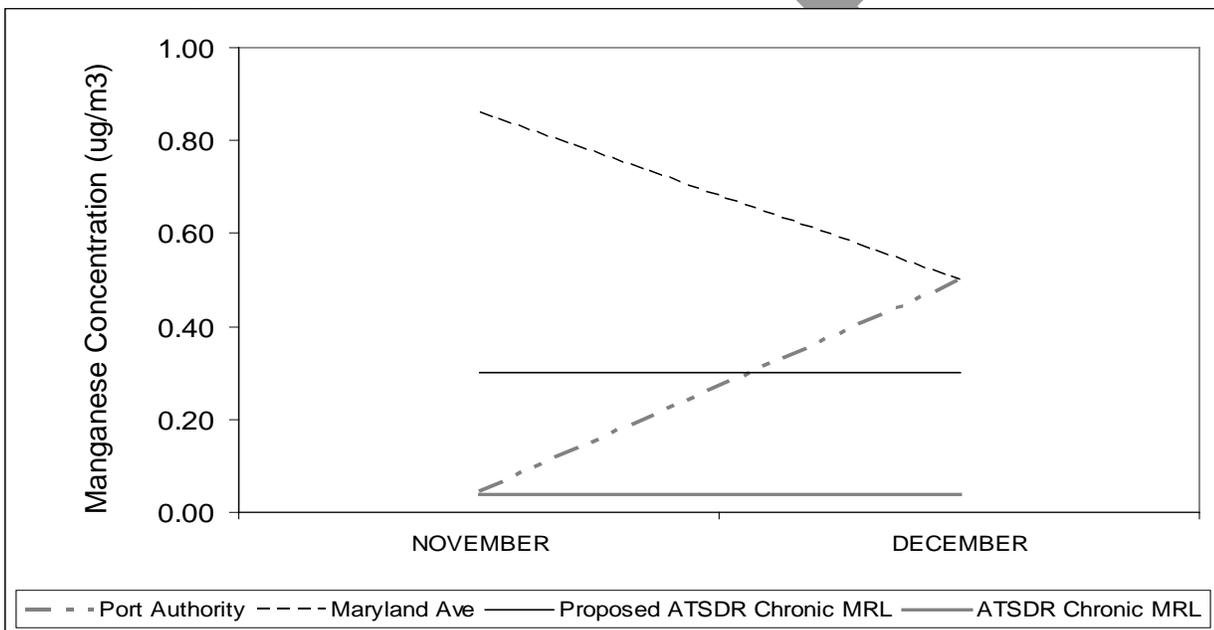
Statistic	Water Plant	Port Authority
<i>Min</i>	0.317	0.170
<i>Arithmetic average</i>	1.53	0.669
<i>Geometric average</i>	1.20	0.520
<i>25th percentile</i>	0.795	0.300
<i>50th percentile</i>	1.55	0.531
<i>75th percentile</i>	2.19	0.940
<i>90th percentile</i>	2.55	1.23
<i>95th percentile</i>	2.78	1.48
<i>99th percentile</i>	2.96	1.69
<i>Max</i>	3.00	1.74
<i>Std Deviation</i>	0.926	0.511

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**Figure 5. Manganese Concentration at the Water Plant (2001)**



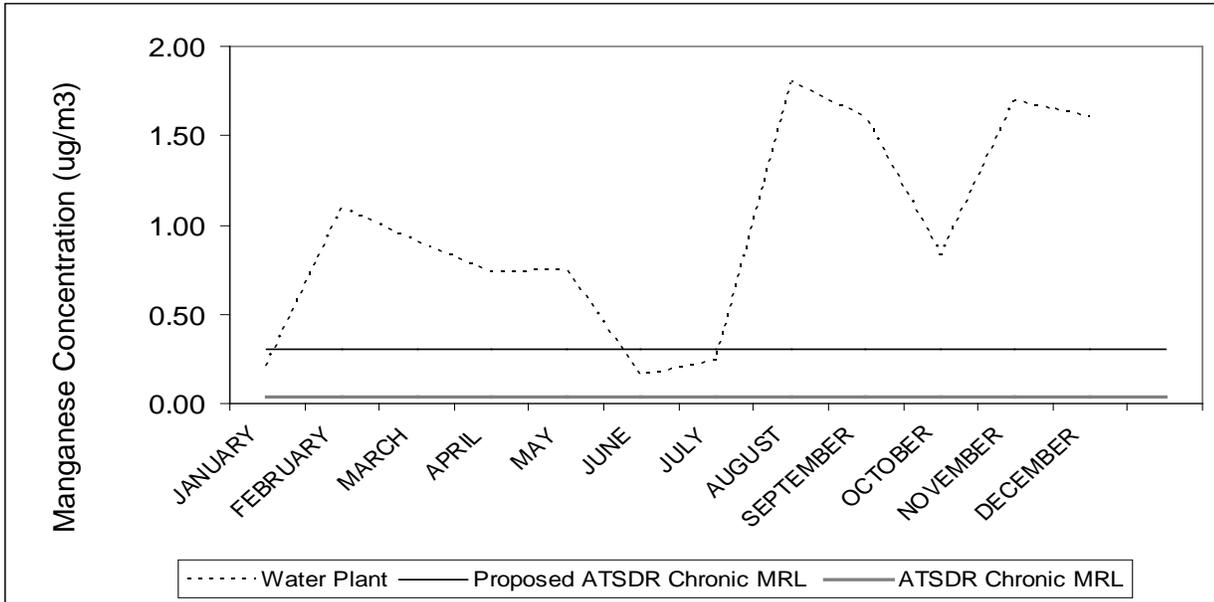
**Figure 6. Manganese Concentration at the Port Authority and Maryland Ave (2001)**



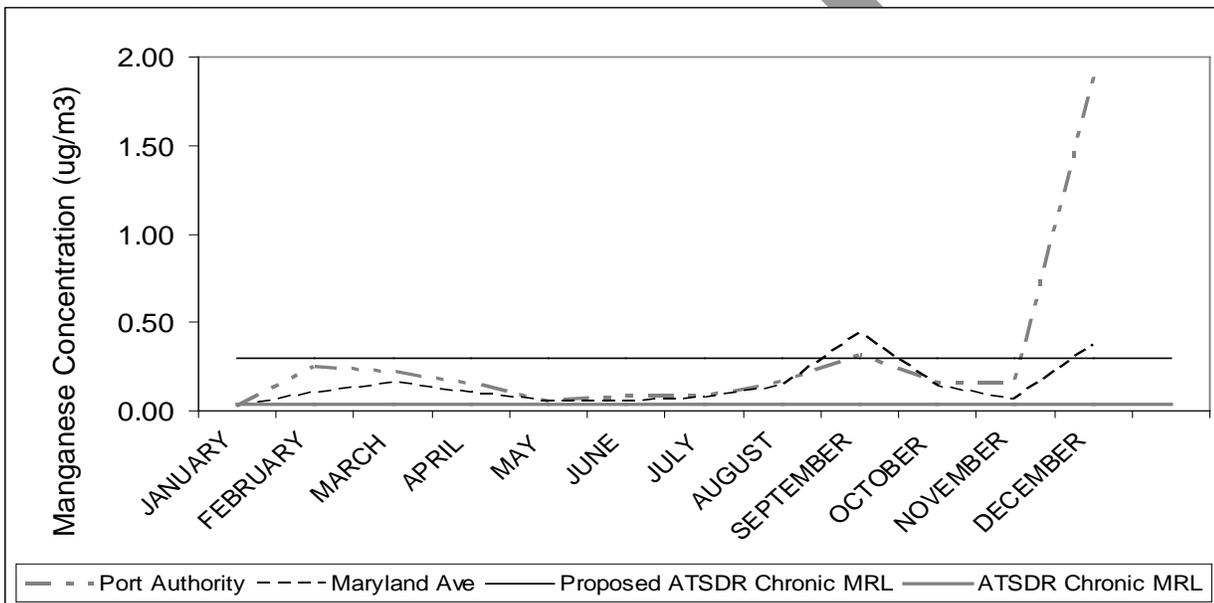
**Table 3. Summary Statistics for Manganese Concentration in Columbiana County (2001)**

Statistic	Water Plant	Port Authority	Maryland Ave
<i>Min</i>	0.380	0.046	0.500
<i>Arithmetic average</i>	0.650	0.273	0.680
<i>Geometric average</i>	0.591	0.152	0.656
<i>25th percentile</i>	0.515	0.160	0.590
<i>50th percentile</i>	0.650	0.273	0.680
<i>75th percentile</i>	0.785	0.387	0.770
<i>90th percentile</i>	0.866	0.456	0.824
<i>95th percentile</i>	0.893	0.477	0.842
<i>99th percentile</i>	0.915	0.495	0.856
<i>Max</i>	0.920	0.500	0.860
<i>Std Deviation</i>	0.382	0.321	0.255

**Figure 7. Manganese Concentration at the Water Plant (2003) (no data were collected in 2002)**



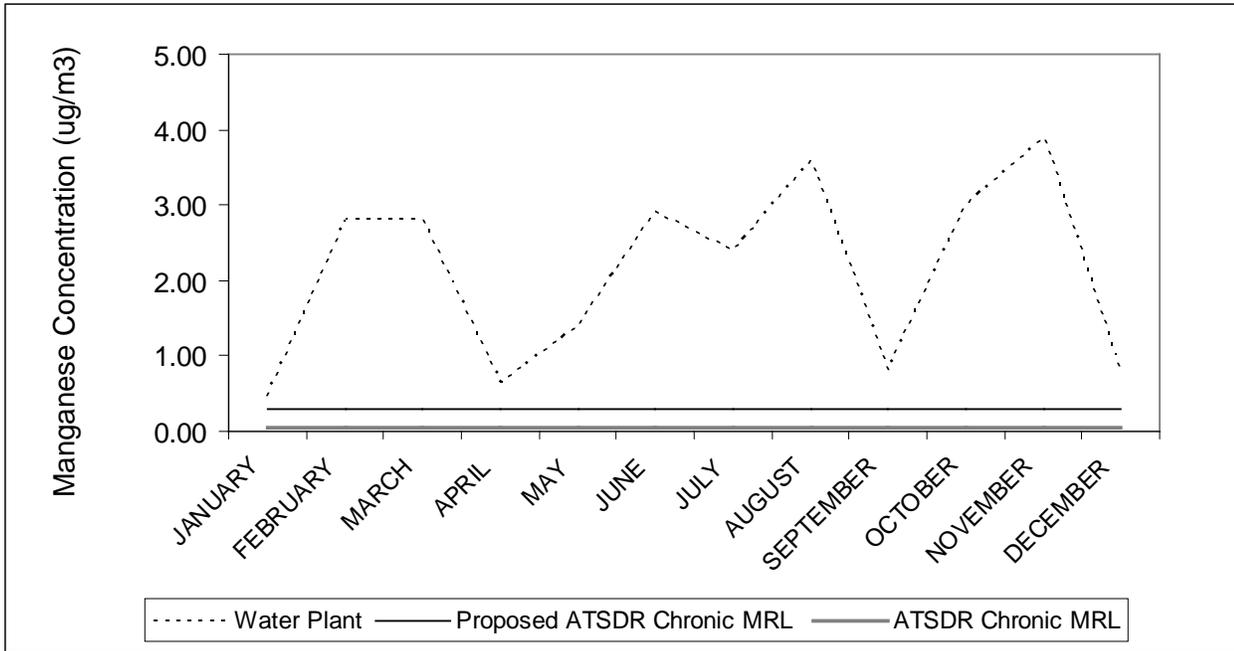
**Figure 8. Manganese Concentration at the Port Authority and Maryland Ave (2003)**



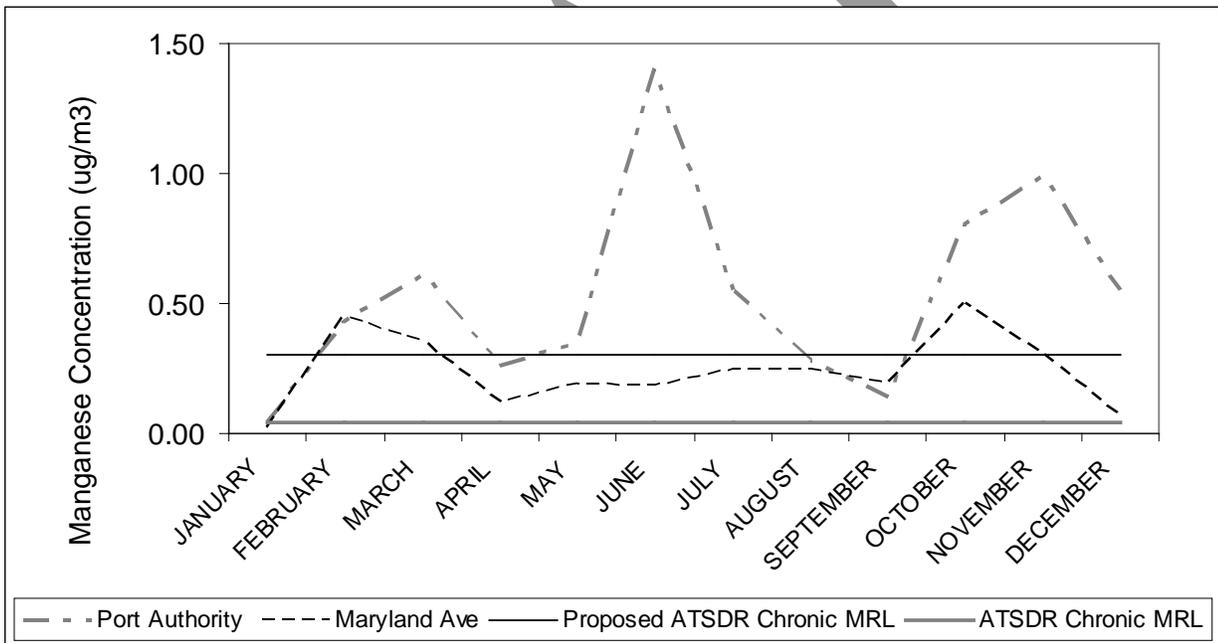
**Table 4. Summary Statistics for Manganese Concentration in Columbiana County (2003)**

Statistic	Water Plant	Port Authority	Maryland Ave
<i>Min</i>	0.160	0.030	0.0300
<i>Arithmetic average</i>	0.969	0.299	0.144
<i>Geometric average</i>	0.744	0.160	0.106
<i>25th percentile</i>	0.615	0.085	0.062
<i>50th percentile</i>	0.865	0.160	0.099
<i>75th percentile</i>	1.60	0.228	0.145
<i>90th percentile</i>	1.69	0.313	0.349
<i>95th percentile</i>	1.75	1.03	0.402
<i>99th percentile</i>	1.79	1.73	0.432
<i>Max</i>	1.80	1.90	0.440
<i>Std Deviation</i>	0.597	0.511	0.129

**Figure 9. Manganese Concentration at the Water Plant (2004)**



**Figure 10. Manganese Concentration at the Port Authority and Maryland Ave (2004)**

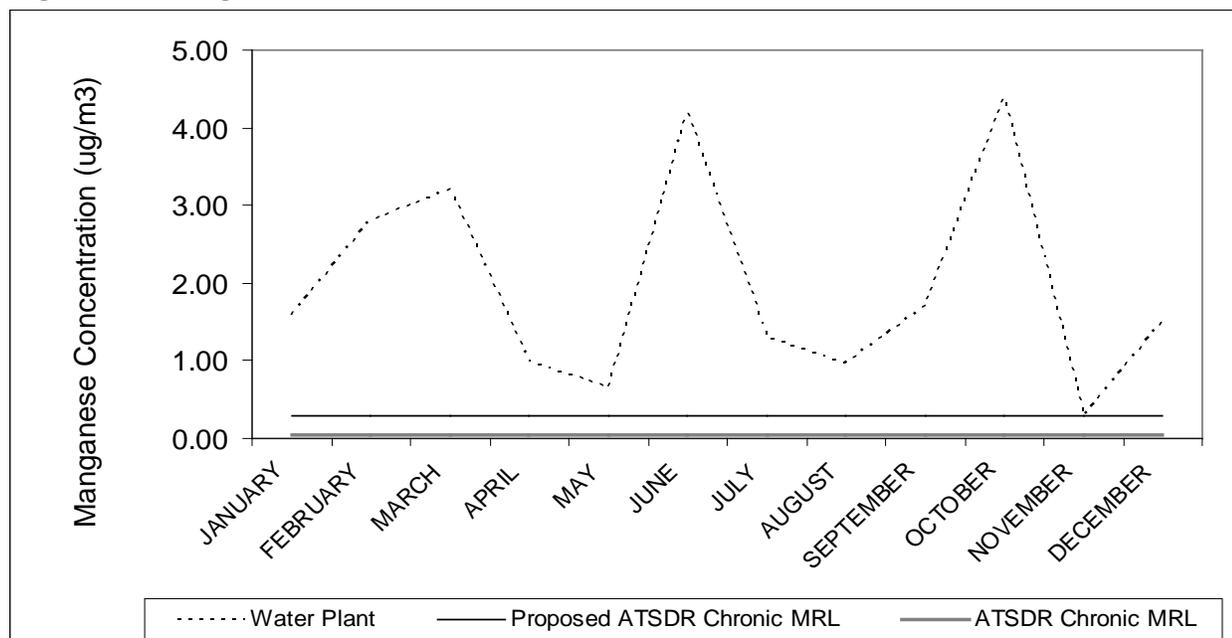


**Table 5. Summary Statistics for Manganese Concentration in Columbiana County (2004)**

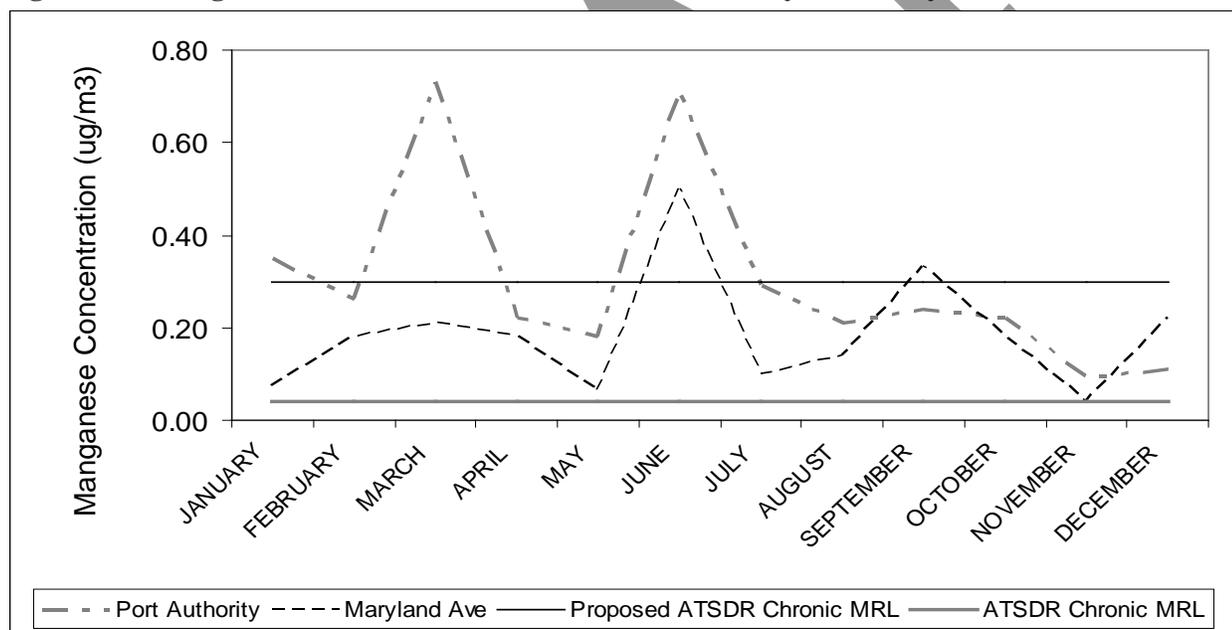
Statistic	Water Plant	Port Authority	Maryland Ave
<i>Min</i>	0.460	0.040	0.019
<i>Arithmetic average</i>	2.13	0.533	0.238
<i>Geometric average</i>	1.71	0.390	0.182
<i>25th percentile</i>	0.808	0.275	0.165
<i>50th percentile</i>	0.808	0.490	0.220
<i>75th percentile</i>	2.93	0.658	0.313
<i>90th percentile</i>	3.54	0.971	0.440
<i>95th percentile</i>	3.74	1.18	0.473
<i>99th percentile</i>	3.87	1.35	0.495

<b>Max</b>	3.90	1.40	0.500
<b>Std Deviation</b>	1.23	0.384	0.145

**Figure 11. Manganese Concentration at the Water Plant (2005)**



**Figure 12. Manganese Concentration at the Port Authority and Maryland Ave (2005)**

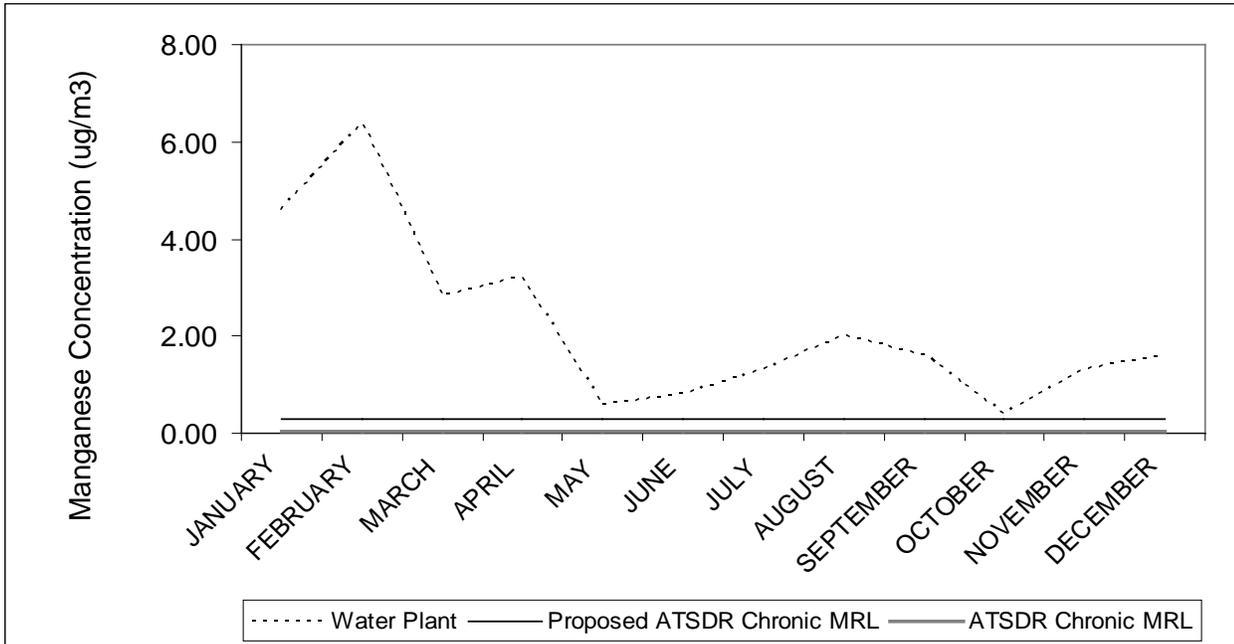


**Table 6. Summary Statistics for Manganese Concentration in Columbiana County (2005)**

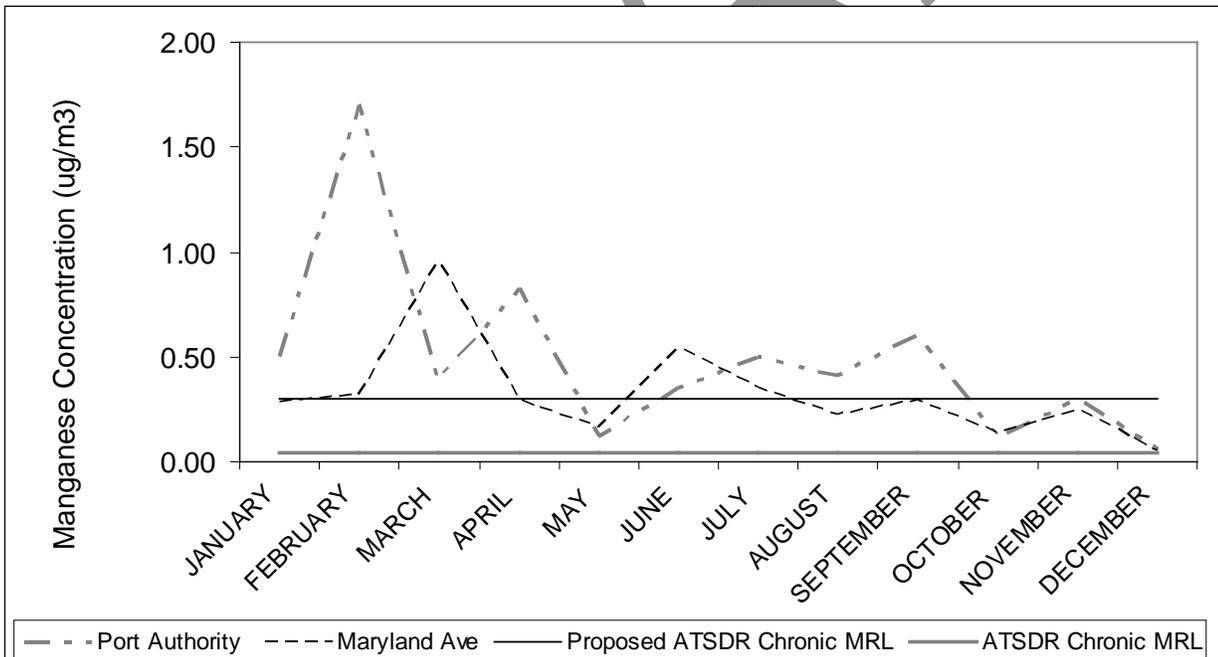
Statistic	Water Plant	Port Authority	Maryland Ave
<b>Min</b>	0.290	0.091	0.042
<b>Arithmetic average</b>	1.97	0.301	0.185
<b>Geometric average</b>	1.52	0.250	0.149
<b>25th percentile</b>	0.985	0.203	0.092
<b>50th percentile</b>	1.55	0.230	0.180
<b>75th percentile</b>	2.90	0.305	0.213
<b>90th percentile</b>	4.10	0.674	0.319
<b>95th percentile</b>	4.29	0.719	0.407

<i>99th percentile</i>	4.38	0.728	0.481
<i>Max</i>	4.40	0.730	0.500
<i>Std Deviation</i>	1.37	0.208	0.128

**Figure 13. Manganese Concentration at the Water Plant (2006)**



**Figure 14. Manganese Concentration at the Port Authority and Maryland Ave (2006)**

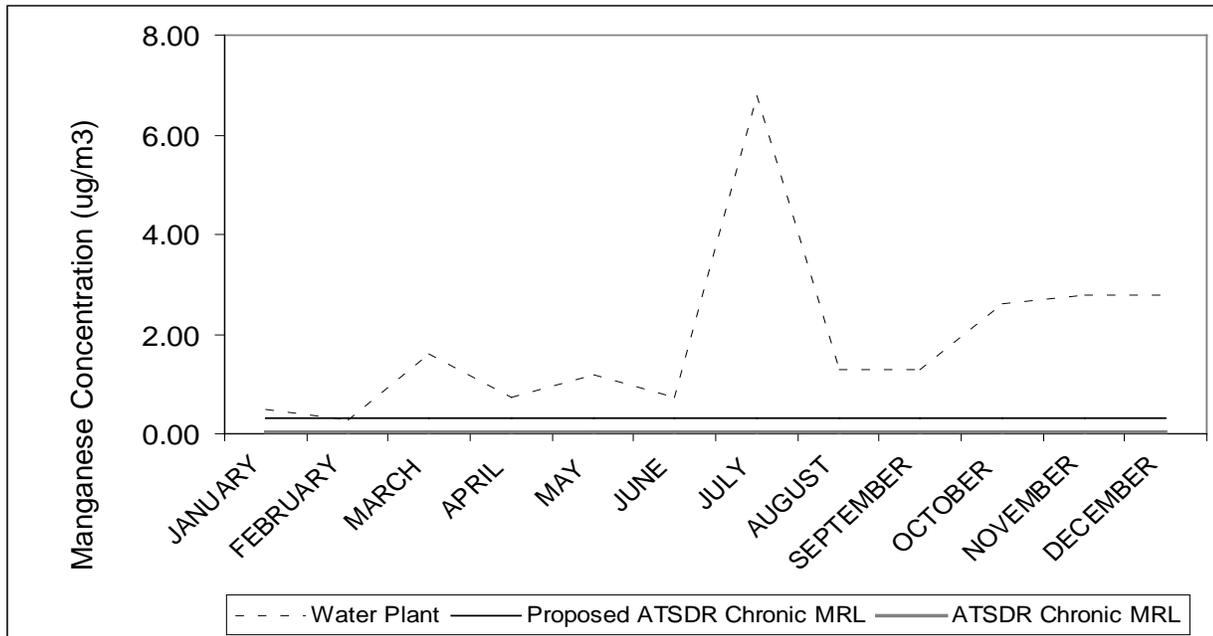


**Table 7. Summary Statistics for Manganese Concentration in Columbiana County (2006)**

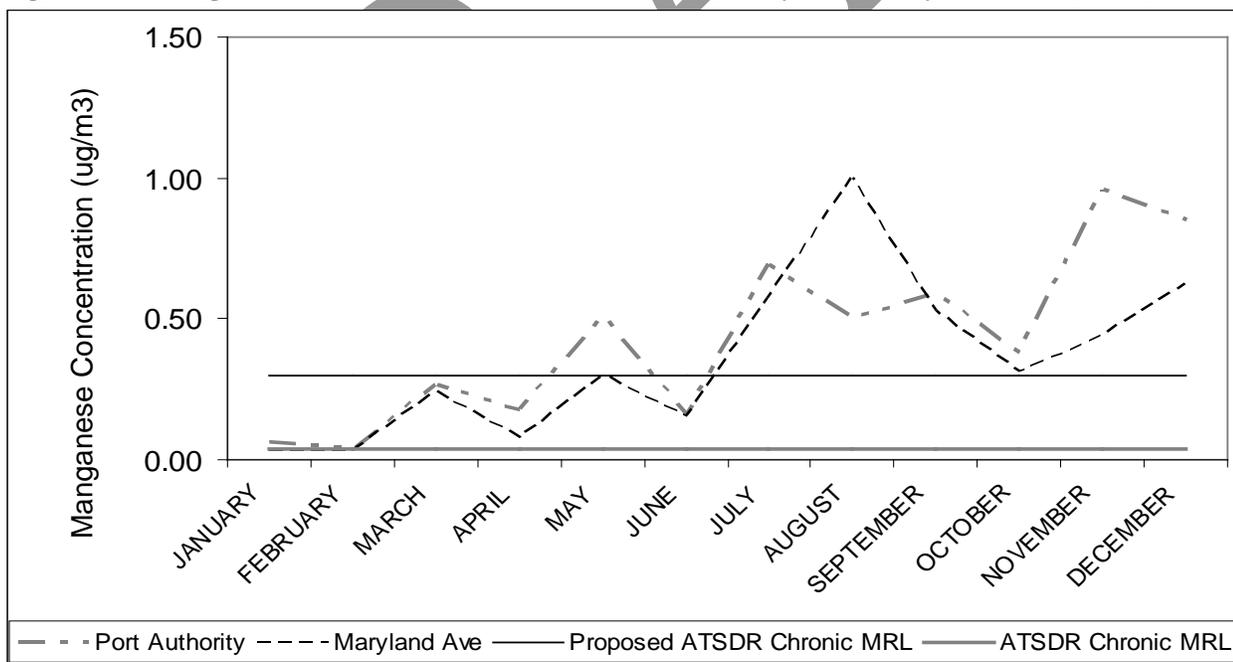
Statistic	Water Plant	Port Authority	Maryland Ave
<i>Min</i>	0.420	0.058	0.048
<i>Arithmetic average</i>	2.216	0.488	0.320
<i>Geometric average</i>	1.66	0.343	0.256
<i>25th percentile</i>	1.18	0.255	0.205
<i>50th percentile</i>	1.60	0.400	0.285

<i>75th percentile</i>	2.90	0.525	0.328
<i>90th percentile</i>	4.46	0.798	0.521
<i>95th percentile</i>	5.41	1.22	0.725
<i>99th percentile</i>	6.20	1.60	0.905
<i>Max</i>	6.40	1.70	0.950
<i>Std Deviation</i>	1.78	0.439	0.233

**Figure 15. Manganese Concentration at the Water Plant (2007)**



**Figure 16. Manganese Concentration at the Port Authority and Maryland Ave (2007)**



**Table 8. Summary Statistics for Manganese Concentration in Columbiana County (2007)**

Statistic	Water Plant	Port Authority	Maryland Ave
<i>Min</i>	0.280	0.036	0.032
<i>Arithmetic average</i>	1.88	0.433	0.359
<i>Geometric average</i>	1.33	0.302	0.230

<i>25th percentile</i>	0.728	0.175	0.132
<i>50th percentile</i>	1.30	0.440	0.305
<i>75th percentile</i>	2.65	0.615	0.540
<i>90th percentile</i>	2.80	0.834	0.615
<i>95th percentile</i>	4.60	0.899	0.791
<i>99th percentile</i>	6.36	0.948	0.958
<i>Max</i>	6.80	0.960	1.000
<i>Std Deviation</i>	1.78	0.304	0.289

Figure 17. Manganese Concentration at the Water Plant (2008)

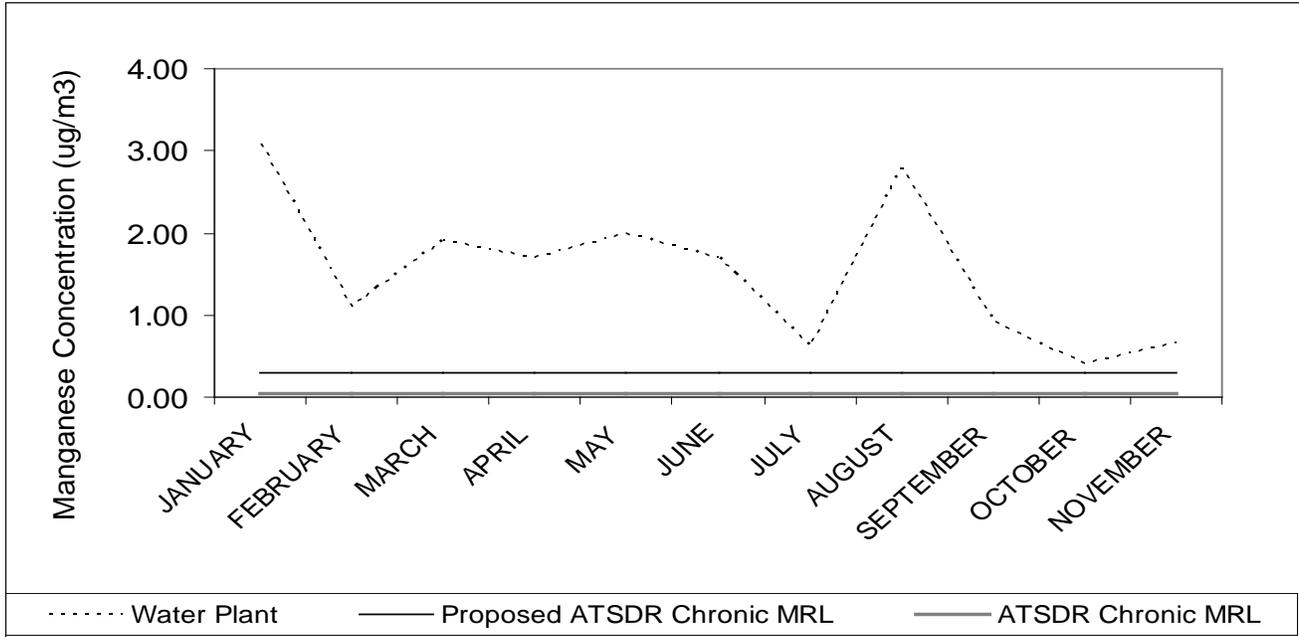


Figure 18. Manganese Concentration at the Port Authority and Maryland Ave (2008)

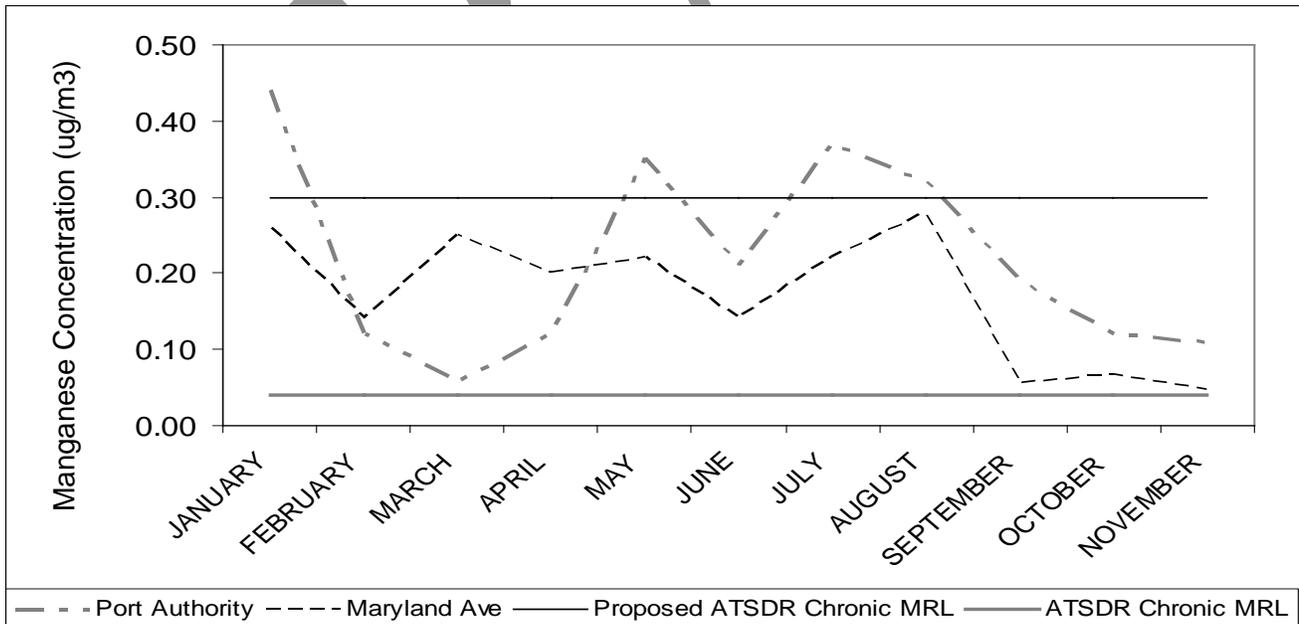


Table 9. Summary Statistics for Manganese Concentration in Columbiana County (2008)

Statistic	Water Plant	Port Authority	Maryland Ave
<i>Min</i>	0.40000	0.05900	0.04700
<i>Arithmetic average</i>	1.53455	0.21900	0.17091

<i>Geometric average</i>	1.281946525	0.183947537	0.145289104
<i>25th percentile</i>	0.785	0.12	0.1035
<i>50th percentile</i>	1.7	0.19	0.2
<i>75th percentile</i>	1.95	0.335	0.235
<i>90th percentile</i>	2.8	0.37	0.26
<i>95th percentile</i>	2.95	0.405	0.27
<i>99th percentile</i>	3.07	0.433	0.278
<i>Max</i>	3.10000	0.44000	0.28000
<i>Std Deviation</i>	0.891216737	0.129154946	0.085454613

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**Appendix C**

**Manganese Concentrations in Columbiana County (1999-2008) Raw Data**

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Table 1. Manganese Concentrations in Columbiana County Raw Data (1999-2008): Composite Samples

Date	MANGANESE in ug/m3		Maryland Avenue
	Water Plant	Port Authority	
Jan-99	2.800	0.163	
Feb-99	3.290	0.966	
Mar-99	1.360	0.269	
Mar-00	1.300		
Apr-00	2.500	0.270	
May-00	0.660	0.170	
Jun-00	1.800	0.640	
Jul-00	2.300	0.330	
Aug-00	1.870	1.740	
Sep-00	0.317	0.531	
Oct-00	1.200	0.300	
Nov-00	3.000	1.100	
Dec-00	0.330	0.940	
Nov-01	0.920	0.046	0.860
Dec-01	0.380	0.500	0.500
Jan-03	0.210	0.030	0.030
Feb-03	1.100	0.250	0.099
Mar-03	0.900	0.220	0.160
Apr-03	0.740	0.160	0.100
May-03	0.750	0.058	0.053
Jun-03	0.160	0.081	0.057
Jul-03	0.240	0.086	0.072
Aug-03	1.800	0.170	0.140
Sep-03	1.600	0.320	0.440
Oct-03	0.830	0.160	0.140
Nov-03	1.700	0.160	0.064
Dec-03	1.600	1.900	0.370
Jan-04	0.460	0.040	0.019
Feb-04	2.800	0.430	0.450
Mar-04	2.800	0.610	0.350
Apr-04	0.640	0.260	0.120
May-04	1.400	0.350	0.190
Jun-04	2.900	0.140	0.180
Jul-04	2.400	0.550	0.250
Aug-04	3.600	0.280	0.250
Sep-04	0.810	0.140	0.190
Oct-04	3.000	0.800	0.500
Nov-04	3.900	0.990	0.300
Dec-04	0.800	0.550	0.061
Jan-05	1.600	0.350	0.074
Feb-05	2.800	0.260	0.180
Mar-05	3.200	0.730	0.210
Apr-05	0.990	0.220	0.180
May-05	0.640	0.180	0.064
Jun-05	4.200	0.710	0.500
Jul-05	1.300	0.290	0.098

Aug-05	0.970	0.210	0.140
Sep-05	1.700	0.240	0.330
<b>Date</b>	<b>Water Plant</b>	<b>Port Authority</b>	<b>Maryland Avenue</b>
Oct-05	4.400	0.220	0.180
Nov-05	0.290	0.091	0.042
Dec-05	1.500	0.110	0.220
Jan-06	4.600	0.500	0.280
Feb-06	6.400	1.700	0.320
Mar-06	2.800	0.390	0.950
Apr-06	3.200	0.820	0.290
May-06	0.570	0.120	0.160
Jun-06	0.800	0.350	0.540
Jul-06	1.300	0.500	0.350
Aug-06	2.000	0.410	0.220
Sep-06	1.600	0.600	0.290
Oct-06	0.420	0.110	0.140
Nov-06	1.300	0.300	0.250
Dec-06	1.600	0.058	0.048
Jan-07	0.480	0.065	0.032
Feb-07	0.280	0.036	0.033
Mar-07	1.600	0.270	0.240
Apr-07	0.730	0.180	0.077
May-07	1.200	0.510	0.300
Jun-07	0.720	0.160	0.150
Jul-07	6.800	0.690	0.570
Aug-07	1.300	0.500	1.000
Sep-07	1.300	0.590	0.530
Oct-07	2.600	0.380	0.310
Nov-07	2.800	0.960	0.440
Dec-07	2.800	0.850	0.620
Jan-08	3.100	0.440	0.260
Feb-08	1.100	0.120	0.140
Mar-08	1.900	0.059	0.250
Apr-08	1.700	0.120	0.200
May-08	2.000	0.350	0.220
Jun-08	1.700	0.210	0.140
Jul-08	0.610	0.370	0.220
Aug-08	2.800	0.320	0.280
Sep-08	0.910	0.190	0.056
Oct-08	0.400	0.120	0.067
Nov-08	0.660	0.110	0.047
Dec-08	0.530	0.080	0.063
Jan-09	0.100	0.018	0.009

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Table 2. Manganese Concentration at the Water Plant Raw Data (2005-2008): Discrete Samples

Date	Water Plant	Date	Water Plant	Date	Water Plant
4-Jan-05	3.400	31-Oct-05	12.000	21-Aug-06	1.800
10-Jan-05	0.830	6-Nov-05	0.420	27-Aug-06	0.290
16-Jan-05	0.093	12-Nov-05	0.560	2-Sep-06	0.960
22-Jan-05	1.500	18-Nov-05	0.160	8-Sep-06	7.600
28-Jan-05	4.900	24-Nov-05	0.300	14-Sep-06	0.480
3-Feb-05	3.200	30-Nov-05	0.370	20-Sep-06	0.260
9-Feb-05	3.600	6-Dec-05	0.280	26-Sep-06	1.300
15-Feb-05	6.300	12-Dec-05	6.400	2-Oct-06	1.300
21-Feb-05	7.400	18-Dec-05	0.610	8-Oct-06	0.210
27-Feb-05	0.170	24-Dec-05	0.210	14-Oct-06	0.310
5-Mar-05	4.200	30-Dec-05	0.490	20-Oct-06	0.075
11-Mar-05	0.470	5-Jan-06	1.200	26-Oct-06	0.840
17-Mar-05	4.200	11-Jan-06	13.000	1-Nov-06	0.530
23-Mar-05	6.600	17-Jan-06	11.000	7-Nov-06	6.100
29-Mar-05	1.200	23-Jan-06	3.500	13-Nov-06	0.240
4-Apr-05	0.990	29-Jan-06	0.600	19-Nov-06	0.110
10-Apr-05	0.970	4-Feb-06	0.320	25-Nov-06	0.690
16-Apr-05	1.100	10-Feb-06	0.920	1-Dec-06	0.900
22-Apr-05	3.100	16-Feb-06	25.000	7-Dec-06	0.170
28-Apr-05	0.190	22-Feb-06	12.000	13-Dec-06	9.800
4-May-05	0.560	28-Feb-06	1.000	19-Dec-06	2.800
10-May-05	2.400	6-Mar-06	12.000	25-Dec-06	0.250
16-May-05	0.470	12-Mar-06	0.250	31-Dec-06	0.220
22-May-05	0.480	18-Mar-06	0.190	6-Jan-07	0.680
28-May-05	0.310	24-Mar-06	2.900	12-Jan-07	0.150
3-Jun-05	1.700	30-Mar-06	8.800	18-Jan-07	1.900
9-Jun-05	2.300	5-Apr-06	0.420	24-Jan-07	0.031
21-Jun-05	8.200	11-Apr-06	14.000	30-Jan-07	0.560
27-Jun-05	5.800	17-Apr-06	6.100	5-Feb-07	0.120
3-Jul-05	0.140	23-Apr-06	0.100	11-Feb-07	0.160
9-Jul-05	0.280	29-Apr-06	1.100	17-Feb-07	0.850
15-Jul-05	3.500	5-May-06	1.900	23-Feb-07	0.073
21-Jul-05	2.800	17-May-06	0.340	13-Mar-07	3.000
27-Jul-05	1.500	23-May-06	0.410	19-Mar-07	3.200
2-Aug-05	2.200	29-May-06	0.120	25-Mar-07	0.410
8-Aug-05	1.300	4-Jun-06	0.110	31-Mar-07	0.680
14-Aug-05	0.290	10-Jun-06	0.200	6-Apr-07	0.260
20-Aug-05	0.370	16-Jun-06	3.800	24-Apr-07	0.680
1-Sep-05	1.300	22-Jun-06	0.740	30-Apr-07	1.400
7-Sep-05	3.700	28-Jun-06	0.680	6-May-07	1.800
13-Sep-05	2.600	4-Jul-06	0.120	12-May-07	0.740
19-Sep-05	2.900	10-Jul-06	4.800	18-May-07	1.400
25-Sep-05	0.830	16-Jul-06	0.380	24-May-07	1.100
1-Oct-05	0.630	22-Jul-06	0.760	30-May-07	1.400
7-Oct-05	0.490	28-Jul-06	1.800	5-Jun-07	0.360
13-Oct-05	3.700	3-Aug-06	7.800	11-Jun-07	1.500

19-Oct-05	23.000	9-Aug-06	1.700	17-Jun-07	0.630
25-Oct-05	1.300	15-Aug-06	0.940	23-Jun-07	0.140
<b>Date</b>	<b>Water Plant</b>	<b>Date</b>	<b>Water Plant</b>		
29-Jun-07	1.600	12-May-08	2.800		
5-Jul-07	0.840	18-May-08	0.090		
11-Jul-07	0.340	24-May-08	0.160		
17-Jul-07	15.000	30-May-08	7.400		
23-Jul-07	21.000	5-Jun-08	4.200		
29-Jul-07	0.560	11-Jun-08	2.000		
4-Aug-07	0.340	17-Jun-08	0.130		
16-Aug-07	0.900	23-Jun-08	0.980		
22-Aug-07	1.300	11-Jul-08	0.150		
28-Aug-07	3.500	17-Jul-08	0.580		
3-Sep-07	0.620	23-Jul-08	0.120		
9-Sep-07	0.160	29-Jul-08	1.900		
15-Sep-07	0.200	4-Aug-08	1.800		
21-Sep-07	4.000	10-Aug-08	0.160		
27-Sep-07	3.200	16-Aug-08	0.140		
3-Oct-07	1.200	22-Aug-08	8.300		
9-Oct-07	1.400	26-Aug-08	6.500		
15-Oct-07	11.000	3-Sep-08	4.100		
21-Oct-07	1.100	9-Sep-08	0.560		
27-Oct-07	0.720	15-Sep-08	0.580		
2-Nov-07	2.400	21-Sep-08	0.350		
8-Nov-07	8.600	27-Sep-08	0.240		
14-Nov-07	2.800	3-Oct-08	0.620		
20-Nov-07	1.700	9-Oct-08	0.590		
26-Nov-07	2.400	15-Oct-08	1.100		
2-Dec-07	0.210	21-Oct-08	0.130		
8-Dec-07	0.056	27-Oct-08	0.062		
14-Dec-07	0.390	2-Nov-08	0.260		
26-Dec-07	16.000	8-Nov-08	0.074		
7-Jan-08	0.720	14-Nov-08	3.600		
13-Jan-08	0.450	20-Nov-08	0.032		
19-Jan-08	0.190	26-Nov-08	0.220		
25-Jan-08	4.900				
31-Jan-08	11.000				
6-Feb-08	0.530				
12-Feb-08	3.100				
18-Feb-08	0.260				
24-Feb-08	0.160				
1-Mar-08	0.270				
7-Mar-08	0.830				
13-Mar-08	4.400				
19-Mar-08	1.700				
25-Mar-08	4.400				
31-Mar-08	2.100				
6-Apr-08	0.370				
12-Apr-08	0.260				

18-Apr-08	3.400
24-Apr-08	3.800
30-Apr-08	1.300
6-May-08	0.840

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